Electronic Brake Controller
Hayes Brake Controller Company P/N 81770
OPERATION MANUAL
For trailers with 2-8 electric brakes and vehicles with 12 volt negative ground systems only.

READ AND SAVE THESE INSTRUCTIONS

• Before beginning installation, read and become familiar with these instructions.

• Leave these instructions in tow vehicle for future reference.

• IMPROPER OPERATION COULD CAUSE PERSONAL INJURY, EQUIPMENT AND PROPERTY DAMAGE.

• Questions on installation, adjustment, trouble shooting, or operation of brake controller? Call 800-892-2676 Monday through Friday between 8:00 a.m. and 5:00 p.m. EST.

SAFETY INFORMATION

WARNING: Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION: Indicates a potentially hazardous situation that, if not avoided, could result in damage to product or property.

TIP: Contains helpful information to facilitate installation.

Automatic Operation During braking, the Endeavor senses deceleration of the tow vehicle. An internal sensor measures the amount of deceleration and sends a proportional amount of power to the trailer brakes. The maximum braking supplied depends on the set up of the controller. The digital display will indicate the amount of power being sent to the trailer brakes. Once the brake pedal is released, the unit will return to “stand by” mode. While standing by, the controller will display the current selected mode of display (% power, voltage, or current). Further explanation of these modes is included in this document.

Digital Display

The digital display shows various symbols and numbers that are used for display and to monitor the trailer brake performance. It is also used when trouble-shooting.

Definitions of Options

WARNING: • Improper adjustment of the controller could result in loss of trailer brakes, aggressive, grabby, pulsating, or delayed trailer brakes.

• Power adjustments may be required based on trailer speed, trailer load, and road conditions.

• Maximum trailer braking occurs just prior to lockup of the trailer wheels.

• Trailer brake lockup could cause loss of control of the trailer and/or the tow vehicle.

Display mode:

• The controller is factory pre-set to display % of maximum power output.

• During braking conditions - the number displayed indicates the % of power being applied to the trailer brakes. The scale for this is 0 to 100.

• It is recommended that display mode P or PH for a hydraulic actuator) be used while operating the trailer.

• PH mode also displays the % of power being applied to the trailer brakes.

• Other available display modes:

  Voltage (V) or EH be used in operation, but it should be noted that the actual voltage supplied to the trailer brakes may vary from the displayed value by as much as 1 Volt.

  Current (I) reading can be used in troubleshooting and setup to ensure that the amperage draw of the trailer brakes is in the proper range based on the number of axles on the trailer.

  DO NOT use this setting while operating the vehicle. With the manually fully on, the decceleration sensor should show approximately 3 amps each.

  DO NOT make current readings with the manual less than full on.

The current reading may vary significantly due to temperature changes in the brake magnets.

Changing Display Mode

The symbols (P, E, C, PH or EH) that are displayed under non-braking conditions may be changed as follows:

1. With the vehicle at rest, press the “+” button until the display flashes then release the button. The display will flash a letter, which corresponds to the set display mode (P, E, C, PH or EH).

2. To change the set mode, press the “+” button and release. The display will change from P to E to C to PH to EH with sequential presses of the “+” button.

3. Continue pressing the “+” button until the desired display mode is shown on the display.

4. Press the “-” button until the desired display mode shown on the display.

5. The new display mode is now set.

A. The P display mode is the factory default mode and is the recommended display mode. If the trailer has an Electric over Hydraulic Actuator; the PH display mode is recommended.

B. The PH and the EH display modes do not test for a trailer connection.

C. After a few hours of being inactive, the display will go blank. While the display is blank, very little power will be used by the Endeavor.

Minimum Power: (Manual and Automatic)

WARNING: • In the manual and automatic minimum power setting at 10%, noticeable braking is applied only when the sensor detects deceleration.

• With the vehicle at rest and the brake pedal depressed, there should be only a slight output to the trailer brakes (minimum power setting is set to 10%).

• Higher at rest outputs and reverse braking can be obtained by increasing the minimum power setting.

The controller is factory pre-set to 10%. At this setting, the MINIMUM amount of power that will be immediately applied to the trailer brakes is 10% (when the brake pedal is depressed and before deceleration is detected).

Changing Minimum Power

Changing the minimum power level is designed to allow for more or less power to be delivered to the brakes when the controller does not sense deceleration. See the loaded trailer weight guidelines table in the Road Test and Performance Adjustment section of this document.

Select the minimum power setting required for your loaded trailer weight.

The minimum power level may be changed in 5% increments (available minimum power levels are 10, 15, 20, or 25).

To do this, follow these steps:

1. With the vehicle at rest, press the “-“ button until the display flashes then release the button.

2. The display will flash a number, which corresponds to the set minimum power as a percentage of total available power (10, 15, 20, and 25).

3. To change the set value, press the “-“ button and release. The display will change to the next highest available value with sequential presses of the “-“ button.

3. Continue pressing the “-“ button until the desired minimum power level is displayed on the display for several seconds.

4. Press the “+“ button until display stops flashing and release.

Note: The higher the minimum power setting the more aggressive the braking. Higher at rest outputs and reverse braking can be obtained by increasing the minimum power setting.

Maximum Power: (Automatic only)

The controller is pre-set to 50%. When the controller senses maximum deceleration, the most power that the controller will send to the trailer brakes (with a 50 maximum power setting) will be 50%.

Changing Maximum Power: (Automatic only)

Note: To change the maximum power level, the controller must be displaying P, E, C, PH, or EH (not flashing).

The maximum power may be changed from the default 50% value by doing the following:

1. With the vehicle at rest, press either the “+“ or “-“ button momentarily and release. The set maximum power will be displayed.

2. While this maximum power value is displayed, press either the “+“ (increase) or “-“ (decrease) button to make changes to the target power setting. The power percentage will change in increments of 5% with each sequential button push.

3. The controller is instantly set to the newly displayed power setting.

4. When no button has been pressed for several seconds, the display will change to display mode (P, E, C, PH, or EH).

NOTE: When the value reaches 100%, the display will read “99.”

Adjusting the Deceleration Sensor

WARNING: • Improper adjustment of the deceleration sensor may result in poor performance of trailer brakes.

• Brakes may be unresponsive, grabby, delayed, or pulsing.

1. Connect the trailer to the tow vehicle for this adjustment. If a level loading hitch system is used, it should be connected and operational. Position the tow vehicle and trailer on a flat level surface. Make sure the tow vehicle stop lights are operating correctly.

2. Set the power level to maximum (100%). See Changing Maximum Power section.

3. Set the display mode to “P” (% power output). See Changing Display Mode section.

4. Verify that the maximum power setting is 10. If not, change to 10. See Changing Maximum Power section.

Controller Features and Settings

The controller features the following options, selections and settings:

Digital Display

The display shows different symbols and numbers for displaying the currently selected power output. It may also be used when troubleshooting.

Table 1 - Front view of Endeavor

Table 2 - Side view of Endeavor
5. Depress the brake pedal to turn on the vehicle stoplights. Hold this position.
6. Pull the deceleration sensor-levelling arm (Fig. 3) fully toward the rear of the tow vehicle.

The display value should increase to a value greater than 10.
7. Push the deceleration sensor-levelling arm forward until the display value reads 10.

The leveling arm should now point directly downward. (Fig. 2) Repeat steps 5, 6, and 7 several times to ensure the displayed value has just reached the minimum value 10.
8. After the initial set-up (leveling the deceleration sensor), the minimum power level may be changed from 10 (pre-set) to 15, 20, or 25 percent. Reference \textit{Changing Minimum Power} section.
9. The maximum power level can now be lowered to a level less than the 100%. Reference \textit{Changing Maximum Power} section.

Manual Slide Lever Operation

- The manual slide lever is used in emergency power sections when more braking may be required than is available with the maximum power setting or for control of the trailer brake magnets “bhm” when operating the trailer brakes.
- The tow vehicle and trailer brake stop-lights will be illuminated during the manual lever activation.

TIP: It is normal to hear the trailer brake magnets “bhm” when operating the trailer brakes.

Troubleshooting using the manual slide

To verify the brake controller is properly working, follow these steps:

A. Disconnect the tow vehicle/trailer electrical connector. Set the display mode to PH. Move the manual slide lever (Figure 1) to the left. The displayed value should increase and the tow vehicle stops lamps must illuminate.

B. If SC is displayed, the tow vehicle has a short to ground in the trailer brake circuit or the white ground wire is not connected to ground. Check and/or repair wiring and the tow vehicle/trailer brake controller.

C. If the stop lamps do not illuminate, check the red stoplight wire connection of the backup trailer-brake control for connections to the non-powered stop lamp wire of the tow vehicle stop lamp switch. Set the display mode to "bF" if trailer does not have electric/hydraulic brakes.

D. Connect the tow vehicle/trailer electrical connector. If the display flashes OC, check and repair blue wire connections and brake coil connections. The controller does not see a brake.

E. Move the manual lever to the left. The displayed value should decrease and the trailer stop lamps must illuminate.

F. If SC or CL is displayed, check the trailer brake magnets and trailer brake circuit (including the tow vehicle/trailer connector) for a short to ground.

G. If the trailer stop lamps do not illuminate, check and repair trailer wiring, bulbs, bulb ground connections, and the tow vehicle/ trailer connector.

H. Also check the red stoplight wire connection of the brake controller for connections to the non-powered stop lamp wire of the vehicle stop lamp switch.

Road Test and Performance Adjustment

To set the controller up for optimum performance with your tow vehicle / trailer combination, follow these steps:

A. Locate the tow vehicle and trailer on a hard, flat, dry surface.

B. Set the display mode to 0% power (P or PH for Hydraulic Actuator). See \textit{Changing Display Mode} section. A. Locate the tow vehicle and trailer on a hard, flat, dry surface.

B. Set the display mode to 0% power (P or PH for Hydraulic Actuator). See \textit{Changing Display Mode} section.

C. Adjust the power setting to 50% using the instructions in the \textit{Changing Maximum Power} section.

D. Accelerate to approximately 25 mph and apply the brakes in a normal manner. The vehicle should come to a stop without the trailer "pushing" the tow vehicle. A firm braking action should occur.

E. If the trailer brakes lock, decrease the power level.

F. If more braking power is needed, increase the power level.

G. Repeat this process until the desired braking level is achieved.

H. If needed, follow the instructions in the \textit{Changing Minimum Power} section to increase or decrease the minimum power. The following guidelines should be used as a starting point for selecting this option:

<table>
<thead>
<tr>
<th>If the Loaded Trailer weight is...</th>
<th>Then set the Minimum Power to...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than the tow vehicle</td>
<td>10</td>
</tr>
<tr>
<td>Roughly equal to the tow vehicle</td>
<td>10 or 15</td>
</tr>
<tr>
<td>Slightly greater than the tow vehicle</td>
<td>15 or 20</td>
</tr>
<tr>
<td>Much greater than the tow vehicle</td>
<td>20 or 25</td>
</tr>
</tbody>
</table>

TIP: It is normal to hear the trailer brake magnets “bhm” when operating the trailer brakes.

There are three methods of adjusting the output and responsiveness of the Endeavor Brake Controller. They are listed in the order in which they should be modified:

1. \textbf{Maximum Power Adjustment}: The power is adjustable from 10% to 100% (if minimum power is set at 10). The maximum power level is based on the amount of power available for delivery to the trailer brakes. The total amount of power available is determined by the size and condition of the vehicle's charging system.

2. \textbf{Minimum Power Adjustment}: Changing the minimum power level is designed to allow more or less power to be delivered to the trailer brakes. The initial power compensates for varying load conditions, larger trailers, and heavier loads. The initial braking (before deceleration is detected) can eliminate the feeling of being pushed by the trailer.

3. \textbf{Deceleration Sensor Adjustment}: The display mode of "bF" can be either pushed slightly forward to give a delayed feel or pulled slightly backward to give a more aggressive feel. This adjustment is somewhat coarse as compared to the other two options, so it is not preferred. (Refer to Fig. 3 and 4.)

\textbf{CAUTION}: In the automatic mode and minimum power setting at 10, noticeable braking is applied only when the sensor detects deceleration.

- With the vehicle at rest and the brake pedal depressed, there should be only a slight output to the trailer brakes (when minimum power is set to 10).

- Higher at rest outputs and reverse braking can be obtained by increasing the minimum power setting.

\textbf{NOTE}: If the controller does not perform properly, check for one of the conditions shown in Figures 3 and 4.

Troubleshooting using the display

The Digital Display will \textit{flash} a symbol to indicate a problem with the trailer, the tow vehicle, or the brake controller.

**Short Circuit:** The display will flash \textit{"bF"}. This indicates that the controller has sensed a direct short between the controller’s output and ground. This condition must be cleared before the controller is used. It is usually an indication that a “hot” wire is connected to ground.

**Current Limit:** The display will flash \textit{"CL"}. This indicates that the controller has sensed a power requirement greater than the controller can deliver. When this occurs, the controller will continue to supply all of the needed current (up to approximately 32 amps). This could result from an intermittent short in the trailer wiring, a faulty brake coil, or too many brake coils connected to the controller.

**Open Circuit:** The display will flash \textit{"OC"}. This is an indication that there is no trailer connector to the tow vehicle. Flashing \textit{"OC"} for a few minutes or until a trailer is connected to the tow vehicle. Connection to an electric over hydraulic trailer brakes can also cause the display to flash \textit{"OC"}. The display will go blank when no load is detected for several minutes.

\textbf{TIP:} If a trailer with electric over hydraulic brakes is connected and \textit{"OC"} is flashing, change the display mode to PH or EH, if PH is recommended. Follow the trouble shooting guide.

\textbf{TIP:} If \textit{"OC"} is flashing (with no trailer connected), the display will turn-off after seven minutes.

\textbf{TIP:} If the trailer brakes are unlocked and \textit{"OC"} is flashing, the controller may still operate \textit{bF} until the cycle is broken either by a brake event or by a discontinuation of the power cycling.

\textbf{Blue Wire Fault:} The display will flash \textit{"bF"}. This occurs when external voltage is detected on the blue wire. The controller will continue to display \textit{bF} until external voltage is removed. Possible causes can be the blue wire being connected to the wrong place, a short in the wiring or the connector, or a faulty or disconnected breakaway switch.

\textbf{3.0 Troubleshooting}

- \textbf{Symptom}: The trailer brakes do not apply
- \textbf{Possible Cause}: The trailer brakes are not properly activated
- \textbf{Remedy}: Check the trailer brake magnets and trailer brake circuit connections to the non-powered stop lamp wire of the tow vehicle stop lamp switch.

- \textbf{Symptom}: An intermittent braking action is experienced
- \textbf{Possible Cause}: The trailer brakes are not properly activated
- \textbf{Remedy}: Check the trailer brake magnets and trailer brake circuit connections to the non-powered stop lamp wire of the tow vehicle stop lamp switch.

- \textbf{Symptom}: The trailer brakes are not applied
- \textbf{Possible Cause}: The trailer brakes are not properly activated
- \textbf{Remedy}: Check the trailer brake magnets and trailer brake circuit connections to the non-powered stop lamp wire of the tow vehicle stop lamp switch.

- \textbf{Symptom}: The trailer brakes are applied
- \textbf{Possible Cause}: The trailer brakes are not properly activated
- \textbf{Remedy}: Check the trailer brake magnets and trailer brake circuit connections to the non-powered stop lamp wire of the tow vehicle stop lamp switch.

- \textbf{Symptom}: The trailer brakes are not applied
- \textbf{Possible Cause}: The trailer brakes are not properly activated
- \textbf{Remedy}: Check the trailer brake magnets and trailer brake circuit connections to the non-powered stop lamp wire of the tow vehicle stop lamp switch.

- \textbf{Symptom}: The trailer brakes are not applied
- \textbf{Possible Cause}: The trailer brakes are not properly activated
- \textbf{Remedy}: Check the trailer brake magnets and trailer brake circuit connections to the non-powered stop lamp wire of the tow vehicle stop lamp switch.